IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	
Larry L. Longden *et al.*	Group Art Unit: **2891**
Ser. No.: **10/065,209**	Examiner: **Dana Farahani**
Filed: **September 25, 2002**	Attorney File No.: **M-73591 UTL**
For: **METHOD AND APPARATUS FOR SHIELDING AN INTEGRATED CIRCUIT FROM RADIATION**	Final Office Action Mailed On: **Nov. 14, 2006**
	Confirmation No.: **8169**

APPEAL BRIEF TO THE BOARD OF PATENT APPEALS AND INTERFERENCES

This Appeal Brief is responsive to the rejections in the Final Office Action mailed on November 14, 2006, in the above-referenced patent application. Notice of Appeal in this case was received by the Office on May 11, 2007. This Appeal Brief is filed within two months of that date, and therefore is timely. If the undersigned attorney is mistaken regarding timeliness of this Appeal Brief, Applicants conditionally petition for an extension of time as needed, and authorization is hereby granted to charge the time extension fee required to file this Appeal Brief to Deposit Account Number 50-3196. Authorization is also granted to charge to the same Deposit Account the Appeal Brief fee (37 C.F.R. § 41.20(b)(2)), and all other fees necessary to file this Appeal Brief.

I
REAL PARTY IN INTEREST

In this Appeal, the real party in interest is Maxwell Technologies, Inc., a Delaware corporation, having a place of business at 9244 Balboa Avenue, San Diego, California 92123.

II
RELATED APPEALS AND INTERFERENCES

Applicants-Appellants, Assignee, and the undersigned attorney do not know of any other appeal, interference, or judicial proceeding that is related to, directly affects, is directly affected by, or has a bearing on the decision of the Board of Patent Appeals and Interferences in this Appeal.

III
STATUS OF CLAIMS

The status of claims in the instant application is as follows:

Claims 1, 3, 6-10, and 19-33 are pending in the application.

Claims 1, 3, 6-10, and 19-33 have been rejected.

Applicants appeal from the rejections of claims 1, 3, 6-10, and 19-33.

IV
STATUS OF AMENDMENTS

No amendments have been filed after the rejection of claims in the Final Office Action mailed on November 14, 2006.

V
SUMMARY OF CLAIMED SUBJECT MATTER

Claim 1

Claim 1 is directed to a radiation shielding integrated circuit device. *E.g.*, specification at page 1, par. [0002][1] (lines 9-11); *id.*, page 10, par. [0047] (lines 29-31).

The integrated circuit device includes a die of an electronic circuit device. *E.g.*, specification at page 11, par. [0048] (lines 1-3); Figures 3 and 4, element 308.

The integrated circuit device further includes an x-ray shielding tub with a bottom portion and sidewalls extending from the bottom portion. *E.g.*, specification at page 11, par. [0048] (lines 1-3); Figures 3 and 4, element 304; specification at page 11, par. [0052] (lines 22-28). The die is disposed on the bottom portion between the sidewalls. *E.g.*, specification at page 11, pars. [0049] and [0052] (lines 4-8 and 22-28); Figures 3 and 4, elements 304 and 308.

The integrated circuit device further includes a base coupled to the bottom portion of the x-ray shielding tub opposite the die. *E.g.*, specification at page 11, pars. [0048]-[0049] (lines 1-8); Figures 3 and 4, element 310.

The integrated circuit device further includes a radiation shielding lid coupled to the base. *E.g.*, specification at page 11, pars. [0048]-[0049] (lines 1-8); Figures 3 and 4, element 302.

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[1] Paragraph numbers refer to the application as filed (downloaded from the USPTO PAIR system); the paragraph numbering appears to be identical to the numbering in the application as published.

The radiation shielding lid and the x-ray shielding tub are positioned to shield the die from x-rays from every angle, whereby the die is shielded from receiving from all directions an amount of radiation greater than a total dose tolerance of the die. *E.g.*, specification at page 11, pars. [0050]-[0052] (lines 9-28).

The radiation shielding lid is not in direct contact with the x-ray shielding tub so that the radiation shielding lid and the x-ray shielding tub do not completely enclose the die. Figures 3 and 4.

Claim 19

Claim 19 is directed to a radiation shielding integrated circuit device. *E.g.*, specification at page 1, par. [0002] (lines 9-11); *id.*, page 5, par. [0028] (lines 7-8).

The integrated circuit device includes a base with a first surface and a second surface opposite the first surface. *E.g.*, specification at page 5, par. [0029] (lines 9-12); Figure 2, element 220.

The integrated circuit device further includes a first x-ray shielding tub with a first bottom portion and first sidewalls extending from the first bottom portion. *E.g.*, specification at page 5, par. [0029] (lines 9-12); Figure 2, element 210. The first x-ray shielding tub is coupled to the first surface of the base. *E.g.*, specification at page 5, par. [0030] (lines 13-24); Figure 2.

The integrated circuit device further includes a second x-ray shielding tub with a second bottom portion and second sidewalls extending from the second bottom portion. *E.g.*, specification at page 5, par. [0029] (lines 9-12); Figure 2, element 212. The second x-ray shielding tub is coupled to the second surface of the base. *E.g.*, specification at page 5, par. [0030] (lines 13-24); Figure 2.

The integrated circuit device further includes a first circuit die. *E.g.*, specification at page 5, par. [0029] (lines 9-12); Figure 2, element 206. The first circuit die is disposed on the first bottom portion between the first sidewalls of the first x-ray shielding tub. *E.g.*, specification at page 5, par. [0030] (lines 13-24); Figure 2.

The integrated circuit device further includes a second circuit die. *E.g.*, specification at page 5, par. [0029] (lines 9-12); Figure 2, element 208. The second circuit die is disposed on the second bottom portion between the second sidewalls of the second x-ray shielding tub. *E.g.*, specification at page 5, par. [0030] (lines 13-24); Figure 2.

The integrated circuit device further includes a radiation shielding top coupled to the base. *E.g.*, specification at page 5, pars. [0029]-[0030] (lines 9-24); Figure 2, element 202.

The integrated circuit device further includes a radiation shielding bottom coupled to the base. *E.g.*, specification at page 5, pars. [0029]-[0030] (lines 9-24); Figure 2, element 204.

The radiation shielding top and the radiation shielding bottom comprise material shielding x-rays and ionizing radiation. *E.g.*, specification at pages 5-6, par. [0031] (page 5, line 25, through

page 6, line 7); *id.*, at page 6, par. [0032] (lines 8-17); *id.*, at page 7, par. [0035] (lines 9-14); *id.*, at page 9, par. [0043] (lines 21-29).

The first x-ray shielding tub and the second x-ray shielding tub comprise material shielding x-rays. *E.g.*, specification at page 6, par. [0033] (lines 18-26); *id.*, at pages 6-7, par. [0034] (page 6, line 27, through page 7, line 8).

The radiation shielding top and the first x-ray shielding tub are positioned to shield the first die from x-rays from any angle. *E.g.*, specification at pages 5-6, par. [0031] (page 5, line 25, through page 6, line 7); *id.*, at page 6, par. [0032] (lines 8-17).

The radiation shielding bottom and the second x-ray shielding tub are positioned to shield the second die from x-rays from any angle. *E.g.*, specification at pages 5-6, par. [0031] (page 5, line 25, through page 6, line 7); *id.*, at page 6, par. [0032] (lines 8-17).

The thickness of the first x-ray shielding tub and the thickness of the radiation shielding top are selected to shield the first circuit die from receiving an amount of x-rays greater than the total dose tolerance of the first circuit die. *E.g.*, specification at page 6, par. [0033] (lines 18-26); *id.*, at pages 7-8, par. [0038] (page 7, line 30, through page 8, line 5).

The thickness of the second x-ray shielding tub and the thickness of the radiation shielding bottom are selected to shield the second circuit die from receiving an amount of x-rays greater than the total dose tolerance of the second circuit die. *E.g.*, specification at page 6, par. [0033] (lines 18-26); *id.*, at pages 7-8, par. [0038] (page 7, line 30, through page 8, line 5).

Claim 28

Claim 28 is directed to an integrated circuit. *E.g.*, specification at page 1, par. [0002] (lines 9-11); *id.* page 5, par. [0028] (lines 7-8), *id.* page 10, par. [0047] (lines 29-31); *id.* page 12, par. [0054] (lines 6-8); *id.* page 12, par. [0058] (lines 19-20); *id.* page 13, pars. [0065]-[0066] (lines 26-30).

The integrated circuit includes at least one circuit die. *E.g.*, specification at page 5, par. [0029] (lines 9-12); Figure 2, elements 206 and 208; specification at page 11, par. [0048] (lines 1-3); Figures 3 and 4, element 308; specification at page 12, par. [0055] (lines 9-11); Figure 5, elements 408; specification at page 12, par. [0059] (lines 21-23); Figure 7, element 512; specification, page 13, par. [0066] (lines 28-30), Figure 9, element 616.

The integrated circuit further includes means for shielding the at least one circuit die from isotropic ionizing radiation. *E.g.*, specification at page 5, par. [0029] (lines 9-12); Figure 2, elements 202 and 204; specification at page 11, par. [0051] (lines 18-21); Figure 3, elements 302 and 306; specification at page 12, par. [0056] (lines 12-15); Figure 5, elements 402 and 406; specification at page 13, par. [0064] (lines 22-25); Figure 7, elements 502 and 510; specification at page 14, par. [0067] (lines 1-6); Figure 9, elements 602 and 614. The means for shielding the at least one circuit die from isotropic ionizing radiation is configured to shield the at least one circuit die from x-ray radiation from first selected angles, and allows x-rays to reach the at least one circuit die from second selected angles. *E.g.*, specification at pages 5-6, par. [0031] (page 5, line 25, through page 6, line 7); *id.*, at page 6, par. [0032] (lines 8-17); Figure 2, elements 202 and 204, and right side of

angle 222; Figure 3 (right and left sides of the die 308 are not shielded by the top 302 and the bottom 306); Figure 5 (right and left sides of the dies 408 are not shielded by the top 402 and the bottom 406); Figure 7 (right and left sides of the die 512 are not shielded by the top 502 and the bottom 510); Figure 9 (right and left sides of the die 616 are not shielded by the top 602 and the bottom 614).

The integrated circuit further includes means for shielding the at least one circuit die from x-ray radiation from all angles. *E.g.*, specification at pages 5-6, par. [0031] (page 5, line 25, through page 6, line 7); *id.*, at page 6, par. [0032] (lines 8-17); Figure 2, elements 202, 204, 210, and 212; specification at page 11, par. [0052] (lines 22-28); Figure 3, elements 302, 304, and 306; specification at page 12, par. [0056] (lines 12-15); Figure 5, elements 402, 404, and 406; specification at page 13, par. [0063] (lines 15-21); Figure 7, elements 502, 508, and 510; specification at page 14, par. [0067] (lines 1-6); Figure 9, elements 602, 608, 612, and 614.

Claim 29

Claim 29 is directed to an integrated circuit. *E.g.*, specification at page 1, par. [0002] (lines 9-11); *id.* page 10, par. [0047] (lines 29-31).

The integrated circuit includes at least one circuit die. *E.g.*, specification at page 11, par. [0048] (lines 1-3); Figure 3, element 308.

The integrated circuit further includes an x-ray shielding tub comprising a bottom portion and sidewalls extending from the bottom portion, the bottom portion and the sidewalls comprising material for shielding from x-rays. *E.g.*, specification at page 11, par. [0048] (lines 1-3); *id.*, page 11, pars. [0050]-[0052] (lines 9-28); Figure 3, element 304.

The integrated circuit further includes a first radiation shielding lid comprising material for shielding from ionizing radiation and x-rays. *E.g.*, specification at page 11, par. [0048] (lines 1-3); *id.*, page 11, pars. [0050]-[0052] (lines 9-28); Figure 3, element 302.

The integrated circuit further includes a second radiation shielding lid comprising material for shielding from ionizing radiation and x-rays. *E.g.*, specification at page 11, par. [0048] (lines 1-3); *id.*, page 11, pars. [0050]-[0052] (lines 9-28); Figure 3, element 306.

The at least one circuit die is disposed in the x-ray shielding tub. *E.g.*, specification at page 11, par. [0049] (lines 4-8); Figure 3.

The x-ray shielding tub is disposed between the first radiation shielding lid and the second radiation shielding lid. *E.g.*, specification at page 11, par. [0049] (lines 4-8); Figure 3.

The x-ray shielding tub, the first radiation shielding lid, and the second radiation shielding lid are configured to shield the at least one circuit die from x-rays from every direction. *E.g.*, specification at page 11, par. [0050] (lines 9-17).

The x-ray shielding tub, the first radiation shielding lid, and the second radiation shielding lid do not completely enclose the at least one circuit die. *E.g.*, Figure 3.

Claim 33

Claim 33 is directed to an integrated circuit. *E.g.*, specification at page 1, par. [0002] (lines 9-11); *id.*, page 5, par. [0028] (lines 7-8).

The integrated circuit includes a base. *E.g.*, specification at page 5, par. [0029]; Figure 2, element 220.

The integrated circuit further includes at least one circuit die. *E.g.*, specification at page 5, par. [0029] (lines 9-12); Figure 2, elements 206 and 208.

The integrated circuit further includes an x-ray shielding tub comprising a bottom portion and sidewalls extending from the bottom portion, the bottom portion and the sidewalls comprising material for shielding from x-rays. *E.g.*, specification at page 5, par. [0029] (lines 9-12); *id.*, page 6, par. [0033] (lines 18-26); Figure 2, element 210.

The integrated circuit further includes a first lid comprising material for shielding from ionizing radiation and x-rays. *E.g.*, specification at page 5, par. [0029] (lines 9-12); *id.*, pages 5-6, pars. [0031]-[0032] (page 5, line 25, through page 6, line 17); Figure 2, element 202.

The integrated circuit further includes a second lid comprising material for shielding from ionizing radiation and x-rays. *E.g.*, specification at page 5, par. [0029] (lines 9-12); *id.*, pages 5-6, pars. [0031]-[0032] (page 5, line 25, through page 6, line 17); Figure 2, element 204.

The integrated circuit further includes a first spacing ring comprising material for shielding from x-rays. *E.g.*, specification at page 5, par. [0029] (lines 9-12); *id.*, page 10, par. [0046] (lines 23-28); Figure 2, element 216.

The integrated circuit further includes a second spacing ring comprising material for shielding from x-rays. *E.g.*, specification at page 5, par. [0029] (lines 9-12); *id.*, page 10, par. [0046] (lines 23-28); Figure 2, element 218.

The at least one circuit die is disposed in the x-ray shielding tub. *E.g.*, specification at page 5, par. [0030] (lines 13-24); Figure 2.

The x-ray shielding tub is disposed on the base between the first lid and the second lid. *E.g.*, specification at page 5, par. [0030] (lines 13-24), Figure 2.

The first spacing ring is disposed between the base and the first lid, surrounding the x-ray shielding tub. *E.g.*, specification at page 5, par. [0030] (lines 13-24); *id.*, page 10, par. [0046] (lines 23-28); Figure 2.

The second spacing ring is disposed between the base and the second lid. *E.g.*, specification at page 5, par. [0030] (lines 13-24); *id.*, page 10, par. [0046] (lines 23-28); Figure 2.

The x-ray shielding tub, the first and second lids, and the first and second spacing rings are configured to shield the at least one circuit die from x-rays from every direction. *E.g.*, specification at pages 5-6, par. [0031] (page 5, line 25, through page 6, line 7); *id.*, at page 6, par. [0032] (lines 8-17); Figure 2.

The x-ray shielding tub, the first and second lids, and the first and second spacing rings do not completely enclose the at least one circuit die. *E.g.*, Figure 2.

VI
GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

1. Claims 1, 6, 7, and 28 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Strobel *et al.*, U.S. Patent Number 6,720,493 ("Strobel" in this Appeal Brief);

2. Claims 3, 8, 9, and 10 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Strobel; and

3. Claims 19-27 and 29-33 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over alleged admitted prior art ("alleged APA") in view of Strobel.

VII
ARGUMENT

A. Independent Claim 1

Claim 1 stands rejected as being anticipated by Strobel. For convenience of discussion, the claim is set forth below:

> 1. A radiation shielding integrated circuit device comprising:
>
> a die of an electronic circuit device;
>
> an x-ray shielding tub comprising a bottom portion and sidewalls extending from the bottom portion, the die being disposed on the bottom portion between the sidewalls;
>
> a base coupled to the bottom portion of the x-ray shielding tub opposite the die; and
>
> a radiation shielding lid coupled to the base;
>
> wherein
>
> the radiation shielding lid and the x-ray shielding tub are positioned to shield the die from x-rays from every angle, whereby the die is shielded from receiving from all directions an amount of radiation greater than a total dose tolerance of the die; and
>
> the radiation shielding lid is not in direct contact with the x-ray shielding tub so that the radiation shielding lid and the x-ray shielding tub do not completely enclose the die.

The legal standard for claim anticipation is well established. "A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 U.S.P.Q.2d (BNA) 1051, 1053 (Fed. Cir. 1987). "The identical invention must be shown in as complete detail as is contained in the . . . claim." *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226,

1236, 9 U.S.P.Q.2d (BNA) 1913, 1920 (Fed. Cir. 1989). (Both *Verdegaal* and *Richardson* opinions are quoted with approval in MPEP § 2131.) We respectfully submit that Strobel does not describe, either expressly or inherently, the limitation of *wherein the radiation shielding lid and the x-ray shielding tub are positioned to shield the die from x-rays from every angle, whereby the die is shielded from receiving from all directions an amount of radiation greater than a total dose tolerance of the die.*

In rejecting claim 1, the Final Office Action specifically asserted (pages 2-3) that Strobel's Figure 7B discloses that the radiation shielding lid and the x-ray shielding tub are positioned to shield the die from x-rays from every angle. We disagree with this statement for a number of reasons.

Regarding the embodiment shown in Figures 7A and 7B, Strobel expressly states the following:

> Referring now to FIGS. 7A and 7B, there is shown another radiation shielded package 1200 which is also constructed according to the present invention. The package 1200 is substantially similar to the package 900 of FIGS. 5E and 5F, except that the die attach slug 1290 has been modified to provide additional protection from side angle radiation. In this regard, the die attach slug 1290 includes a bottom member 1292 and side wall members 1293, 1294, 1296 and 1297, secured to the perimeter of the bottom member 1292. The additional side wall members 1293, 1294, 1296 and 1297 provide additional protection from side angle radiation. The height of the side wall members 1293, 1294, 1296 and 1297 can be adjusted to substantially reduce the incidence of side angle radiation on the die 1280.

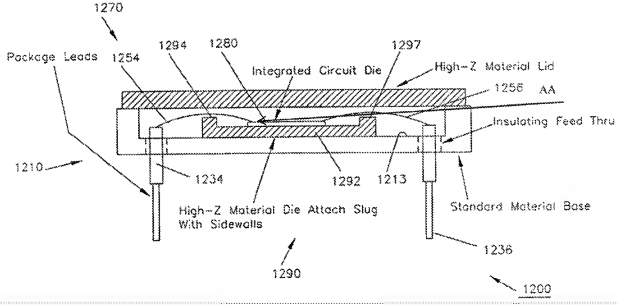
Strobel, col. 9, line 58, through col. 10, line 4 (underlining added for emphasis).

First, although Strobel teaches that the side wall members 1293, 1294, 1296, and 1297 may substantially reduce the incidence of side angle radiation, Strobel does not disclose that that these side wall members shield the die from x-ray radiation from every angle.

Second, Figure 7B itself does not show the actual height of the members 1293 and 1296.

Third, the height of the members 1294 and 1297 shown in Figure 7B is plainly insufficient to shield the die from x-ray radiation from every angle. To illustrate, we reproduced Strobel's Figure 7B below, adding an arrow AA showing an angle from which radiation can reach the die 1280 without penetrating through either the High-Z Material Lid (unnumbered) or the member 1292.

FIGURE 7B.



At least for the above reasons, Applicants respectfully submit that Strobel does not show the identical integrated circuit device in as complete detail as is contained in claim 1. Therefore, Strobel does not anticipate claim 1.

B. Independent Claim 28

Claim 28 also stands rejected as being anticipated by Strobel. The claim is directed to an integrated circuit that includes *means for shielding the at least one circuit die from x-ray radiation from all angles*. This is an express invocation of means plus function claim construction, and, therefore, the limitation "shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof." 35 U.S.C. § 112, sixth paragraph.

The *means for shielding from x-ray radiation* must shield the die from x-ray radiation incident from all angles. As discussed in more detail above in relation to claim 1, Strobel does not disclose such means for shielding. Therefore, Strobel does not anticipate claim 28.

C. Independent Claim 19

Claim 19 stands rejected as being unpatentable over the alleged APA in view of Strobel. For convenience of discussion, the claim is set forth below:

19. A radiation shielding integrated circuit device comprising:

a base comprising a first surface and a second surface opposite the first surface;

a first x-ray shielding tub comprising a first bottom portion and first sidewalls extending from the first bottom portion, the first x-ray shielding tub being coupled to the first surface of the base;

a second x-ray shielding tub comprising a second bottom portion and second sidewalls extending from the second bottom portion, the second x-ray shielding tub being coupled to the second surface of the base;

a first circuit die disposed on the first bottom portion between the first sidewalls of the first x-ray shielding tub;

a second circuit die disposed on the second bottom portion between the second sidewalls of the second x-ray shielding tub;

a radiation shielding top coupled to the base; and

a radiation shielding bottom coupled to the base;

wherein

the radiation shielding top and the radiation shielding bottom comprise material shielding x-rays and ionizing radiation;

the first x-ray shielding tub and the second x-ray shielding tub comprise material shielding x-rays;

the radiation shielding top and the first x-ray shielding tub are positioned to shield the first die from x-rays from any angle;

the radiation shielding bottom and the second x-ray shielding tub are positioned to shield the second die from x-rays from any angle;

the thickness of the first x-ray shielding tub and the thickness of the radiation shielding top are selected to shield the first circuit die from receiving an amount of x-rays greater than the total dose tolerance of the first circuit die; and

the thickness of the second x-ray shielding tub and the thickness of the radiation shielding bottom are selected to shield the second circuit die from receiving an amount of x-rays greater than the total dose tolerance of the second circuit die.

In rejecting this claim, the Final Office Action completely ignored (pages 4-5 and everywhere else) the recitation of two x-ray shielding tubs disposed on the opposite surfaces of the base. But neither the asserted prior art shown in Figure 1 of the present application, nor Figure 7B of Strobel shows multiple tubs disposed on opposite surfaces of the base, or multiple dies disposed in such tubs.

Furthermore, claim 19 recites the limitations wherein *the radiation shielding top and the first*

x-ray shielding tub are positioned to shield the first die from x-rays from any angle, and *the radiation shielding bottom and the second x-ray shielding tub are positioned to shield the second die from x-rays from any angle*. As discussed in more detail above in relation to claim 1, Strobel does not disclose shielding from x-rays from any angle.

Turning next to the reason for combining the alleged APA and Strobel, it is well established that such reason may not be taken from Applicant's disclosure. MPEP § 2143 (citing *In re Vaeck*, 947 F.2d 488, 20 U.S.P.Q.2d (BNA) 1438 (Fed. Cir. 1991)). Here, the motivation appears not merely taken from the disclosure, but from the very claim against which the combination is asserted. The Final Office Action has not offered any explicit analysis justifying the combination, except for a conclusory statement taken from Applicants' claim. But "rejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." *In re Kahn*, 441 F. 3d 977, 988, 78 U.S.P.Q.2D (BNA) 1329 (Fed. Cir. 2006) (*quoted with approval in KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. _____, 127 S. Ct. 1727, 167 L. Ed. 2d 705, 82 U.S.P.Q.2D (BNA) 1385 (2007)).

The Patent and Trademark Office has the burden of making a *prima facie* case of obviousness under 35 U.S.C. § 103. *E.g.*, *In re Mayne*, 104 F.3d 1339, 1342, 41 USPQ2d 1451, 1454 (Fed. Cir. 1997); MPEP § 2142. One basic requirement of a *prima facie* case of obviousness is that the combination of prior art references must teach or suggest all the claim limitations. MPEP § 2143. Another requirement is some articulated analysis explaining why a combination of references would have been made, as discussed in the immediately preceding paragraph. Here, the references do not

disclose or suggest all the claim limitations, and the Final Office Action has not made any explicit analysis justifying the combination of the alleged APA and Strobel. Applicants respectfully submit that a *prima facie* case of obviousness has not been made and claim 19 is patentable at least for these reasons.

D. Independent Claim 29

Claim 29 stands rejected as being unpatentable over the alleged APA in view of Strobel. For convenience, the claim is set forth below:

29. An integrated circuit, comprising:

at least one circuit die;

an x-ray shielding tub comprising a bottom portion and sidewalls extending from the bottom portion, the bottom portion and the sidewalls comprising material for shielding from x-rays;

a first radiation shielding lid comprising material for shielding from ionizing radiation and x-rays; and

a second radiation shielding lid comprising material for shielding from ionizing radiation and x-rays;

wherein:

the at least one circuit die is disposed in the x-ray shielding tub;

the x-ray shielding tub is disposed between the first radiation shielding lid and the second radiation shielding lid;

the x-ray shielding tub, the first radiation shielding lid, and the second radiation shielding lid are configured to shield the at least one circuit die from x-rays from every direction; and

the x-ray shielding tub, the first radiation shielding lid, and the second

radiation shielding lid do not completely enclose the at least one circuit die.

The claim is directed to an integrated circuit wherein *the x-ray shielding tub, the first radiation shielding lid, and the second radiation shielding lid are configured to shield the at least one circuit die from x-rays from every direction*. The at least one circuit die is therefore shielded from x-ray radiation incident from every direction. As discussed in more detail above in relation to claims 1 and 19, Strobel does not disclose shielding a die from x-ray radiation from every direction, and the combination of the alleged APA with Strobel is improper. At least for these reasons, Applicants respectfully submit that a *prima facie* case of obviousness of claim 29 has not been made and the claim is patentable.

E. Independent Claim 33

Claim 33 stands rejected as being unpatentable over the alleged APA in view of Strobel. For convenience, the claim is set forth below:

33. An integrated circuit, comprising:

a base;

at least one circuit die;

an x-ray shielding tub comprising a bottom portion and sidewalls extending from the bottom portion, the bottom portion and the sidewalls comprising material for shielding from x-rays;

a first lid comprising material for shielding from ionizing radiation and x-rays;

a second lid comprising material for shielding from ionizing radiation and x-rays;

a first spacing ring comprising material for shielding from x-rays; and

a second spacing ring comprising material for shielding from x-rays;

wherein:

the at least one circuit die is disposed in the x-ray shielding tub;

the x-ray shielding tub is disposed on the base between the first lid and the second lid;

the first spacing ring is disposed between the base and the first lid, surrounding the x-ray shielding tub;

the second spacing ring is disposed between the base and the second lid;

the x-ray shielding tub, the first and second lids, and the first and second spacing rings are configured to shield the at least one circuit die from x-rays from every direction; and

the x-ray shielding tub, the first and second lids, and the first and second spacing rings do not completely enclose the at least one circuit die.

Initially, note that this claim also is directed to an integrated circuit wherein *the x-ray shielding tub, the first and second lids, and the first and second spacing rings are configured to shield the at least one circuit die from x-rays from every direction*. As discussed in more detail above in relation to claims 1 and 19, Strobel does not disclose shielding a die from x-ray radiation from every direction, and the combination of the alleged APA with Strobel is improper.

Moreover, claim 33 recites first and second spacing rings comprising material for shielding from x-rays. The Final Office Action asserted (pages 4-5) that Strobel discloses high Z spacing rings in Figures 4A-4B and the associated discussion at column 7, lines 55-60. Strobel's 4A and 4B, however, illustrate an embodiment quite different from that of Strobel's Figure 7B. No attempt whatsoever was made to provide an explicit analysis of why the limitations of this embodiment

should be brought into the other asserted art. Equally important, the so-called ring of Strobel's embodiment illustrated in Figures 4A and 4B cannot be considered "spacing" because it is used merely to solder or epoxy one element to another:

> The lid 470 is then secured to the base 410 to enclose the integrated circuit die 480 and enable the total dose radiation received at the integrated circuit die 480 to be reduced to a level which is less than the total dose tolerance of the integrated circuit die 480. The lid 470 is secured to the base 410 using a solder seal technique, e.g., Au—Sn or equivalent, epoxy techniques, or by using resistance welding techniques.

Strobel, col. 7, lines 53-60. Indeed, the so-called ring is not even shown as a separate element in Strobel's Figure 4B, presumably because of its negligible thickness. Still further, there is no disclosure of a second spacing ring. Finally, in the embodiment of Figure 4 the die appears to be completely enclosed, unlike the die of the integrated circuit of claim 33.

At least for these reasons, Applicants respectfully submit that a *prima facie* case of obviousness of claim 33 has not been made and the claim is patentable.

F. Dependent Claim 3

Claim 3 depends from claim 1 and recites this additional limitation: *wherein the x-ray shielding tub has a first thickness, the radiation shielding lid has a second thickness, the second thickness being greater than the first thickness so that the radiation shielding lid provides greater shielding of ionizing radiation than the x-ray shielding tub.* The claim stands rejected as being unpatentable over Strobel. The Final Office Action acknowledged that Strobel does not expressly state that the thickness of the lid is greater than the thickness of the tub, but then asserted that adding this limitation would have been obvious in order to be able to use the device in an environment that

has more radiation directed toward the chip from the top portion of the device. We take issue with the last statement.

First, a device with the same thickness of the lid and the tub would still be operational in the environment that has more radiation directed toward the chip from the top portion of the device, as long as the thickness of the lid is sufficient. Even a device with the reversed relationship of thicknesses would be operational in such environment, provided the lid thickness is sufficient.

Second, the Final Office Action fails to give an example of such an environment: that is, an environment where more radiation is predictably directed to the chip from a particular direction. As regards ionizing radiation in space, it is generally believed to be isotropic. See the present application, paragraph [0005]. As regards x-ray radiation due to nuclear detonation, its direction is likely to be random. *Id.* par. [0006]. Even if an environment that has more radiation from a direction known *a priori* could be identified, the direction relative to the integrated circuit would have to remain stable over the life of the circuit. A person skilled in the art would have to consider these limitations before being motivated to use differentiated thicknesses.

At least for these reasons, Applicants respectfully submit that dependent claim 3 is separately patentable.

G. Dependent Claim 8

Claim 8 depends from claim 1 and adds *a spacing ring coupled to the radiation shielding lid and to the base*. The claim stands rejected as being unpatentable over Strobel. As discussed in more detail above in relation to claim 33, Strobel does not disclose a "spacing" ring, and the Final Office

Action does not provide explicit analysis of why the limitations of the embodiment of Strobel's Figures 4A and 4B would be combined with the embodiment of Strobel's Figure 7B. At least for these reasons, Applicants respectfully submit that dependent claim 8 is separately patentable.

H. Dependent Claim 21

Claim 21 depends from claim 19 and adds *a first spacing ring coupled to the radiation shielding top and to the base*, and *a second spacing ring coupled to the radiation shielding bottom and to the base*. The claim stands rejected as being unpatentable over the alleged APA in view of Strobel. As discussed in more detail above in relation to claim 33, (1) Strobel does not disclose a "spacing" ring, (2) Strobel does not disclose two such rings, and (3) the Final Office Action does not provide explicit analysis of why the limitations of the embodiment of Strobel's Figures 4A and 4B would be combined with other art. At least for these reasons, Applicants respectfully submit that dependent claim 21 is separately patentable.

I. Dependent Claim 27

Claim 27 depends from claims 19 and 20, and adds the following limitations: *thickness of the radiation shielding top is greater than thickness of the first x-ray shielding tub*, and *thickness of the radiation shielding bottom is greater than thickness of the second x-ray shielding tub*. The claim stands rejected as being unpatentable over the alleged APA in view of Strobel. As is discussed in more detail above in relation to claim 3, the art does not disclose or suggest the limitations related to different thicknesses. At least for this reason, Applicants respectfully submit that claim 27 is separately patentable.

J. Dependent Claim 31

Claim 31 depends from claim 29 and adds the following limitations: *the x-ray shielding tub provides less shielding of ionizing radiation than the first radiation shielding lid*, and *the x-ray shielding tub provides less shielding of ionizing radiation than the second radiation shielding lid*. The claim stands rejected as being unpatentable over the alleged APA in view of Strobel. As is discussed in more detail above in relation to claim 3, the art does not disclose or suggest the limitations related to different thicknesses or different shielding ability. At least for this reason, Applicants respectfully submit that claim 31 is separately patentable.

K. Dependent Claim 32

Claim 32 depends from claim 29 and adds the following limitations: *the x-ray shielding tub is thinner than the first radiation shielding lid*, and *the x-ray shielding tub is thinner than the second*

radiation shielding lid. The claim stands rejected as being unpatentable over the alleged APA in view of Strobel. As is discussed in more detail above in relation to claim 3, the art does not disclose or suggest the limitations related to different thicknesses. At least for this reason, Applicants respectfully submit that claim 32 is separately patentable.

L. Remaining Dependent Claims

The arguments above address patentability of all independent claims and of selected dependent claims. Remaining dependent claims should be patentable at least for the reasons given regarding their respective base claims and intervening claims, if any.

VIII
CONCLUSION

For the foregoing reasons, Applicants-Appellants respectfully submit that all pending claims are patentable and request reversal of the rejections.

Respectfully submitted,

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CLAIMS APPENDIX

The following is a listing of the claims in the application. Claims 1, 3, 6-10, and 19-33 have been rejected and are involved in this Appeal.

1. A radiation shielding integrated circuit device comprising:

a die of an electronic circuit device;

an x-ray shielding tub comprising a bottom portion and sidewalls extending from the bottom portion, the die being disposed on the bottom portion between the sidewalls;

a base coupled to the bottom portion of the x-ray shielding tub opposite the die; and

a radiation shielding lid coupled to the base;

wherein

the radiation shielding lid and the x-ray shielding tub are positioned to shield the die from x-rays from every angle, whereby the die is shielded from receiving from all directions an amount of radiation greater than a total dose tolerance of the die; and

the radiation shielding lid is not in direct contact with the x-ray shielding tub so that the radiation shielding lid and the x-ray shielding tub do not completely enclose the die.

Claim 2 (Cancelled)

3. The radiation shielding integrated circuit device of claim 1 wherein the x-ray shielding tub

has a first thickness, the radiation shielding lid has a second thickness, the second thickness being greater than the first thickness so that the radiation shielding lid provides greater shielding of ionizing radiation than the x-ray shielding tub.

Claims 4 and 5 (Cancelled)

6. The radiation shielding integrated circuit device of claim 1 wherein the radiation shielding lid comprises a high Z material.

7. The radiation shielding integrated circuit device of claim 1 wherein the radiation shielding lid comprises a high Z material and a low Z material.

8. The radiation shielding integrated circuit device of claim 1 further comprising a spacing ring coupled to the radiation shielding lid and to the base.

9. The radiation shielding integrated circuit device of claim 8 wherein the spacing ring comprises a high Z material.

10. The radiation shielding integrated circuit device of claim 8 wherein the spacing ring comprises a low Z material.

Claims 11-18 (Cancelled)

19. A radiation shielding integrated circuit device comprising:

a base comprising a first surface and a second surface opposite the first surface;

a first x-ray shielding tub comprising a first bottom portion and first sidewalls extending from the first bottom portion, the first x-ray shielding tub being coupled to the first surface of the base;

a second x-ray shielding tub comprising a second bottom portion and second sidewalls extending from the second bottom portion, the second x-ray shielding tub being coupled to the second surface of the base;

a first circuit die disposed on the first bottom portion between the first sidewalls of the first x-ray shielding tub;

a second circuit die disposed on the second bottom portion between the second sidewalls of the second x-ray shielding tub;

a radiation shielding top coupled to the base; and

a radiation shielding bottom coupled to the base;

wherein

the radiation shielding top and the radiation shielding bottom comprise material shielding x-rays and ionizing radiation;

the first x-ray shielding tub and the second x-ray shielding tub comprise material shielding x-rays;

the radiation shielding top and the first x-ray shielding tub are positioned to shield the first die from x-rays from any angle;

the radiation shielding bottom and the second x-ray shielding tub are positioned to shield the second die from x-rays from any angle;

the thickness of the first x-ray shielding tub and the thickness of the radiation shielding top are selected to shield the first circuit die from receiving an amount of x-rays greater than the total dose tolerance of the first circuit die; and

the thickness of the second x-ray shielding tub and the thickness of the radiation shielding bottom are selected to shield the second circuit die from receiving an amount of x-rays greater than the total dose tolerance of the second circuit die.

20. The radiation shielding integrated circuit device of claim 19 wherein

the radiation shielding top is spaced from the first sidewalls of the first x-ray shielding tub, so that enclosure of the first circuit die by the radiation shielding top and the first x-ray shielding tub is incomplete; and

the radiation shielding bottom is spaced from the second sidewalls of the second x-ray shielding tub, so that enclosure of the second circuit die by the radiation shielding bottom and the second x-ray shielding tub is incomplete.

21. The radiation shielding integrated circuit device of claim 19 further comprising:

a first spacing ring coupled to the radiation shielding top and to the base;

a second spacing ring coupled to the radiation shielding bottom and to the base.

22. The radiation shielding integrated circuit device of claim 21 wherein the first spacing ring and the second spacing ring comprise a high Z material.

23. The radiation shielding integrated circuit device of claim 21 wherein the first spacing ring and second spacing ring comprise a low Z material.

24. The radiation shielding integrated circuit device of claim 19 wherein the radiation shielding top and the radiation shielding bottom comprise a high Z material.

25. The radiation shielding integrated circuit device of claim 19 wherein the first circuit die is shielded from receiving an amount of radiation greater than a total dose tolerance of the first circuit die.

26. The radiation shielding integrated circuit device of claim 19 wherein the second circuit die is shielded from receiving an amount of radiation greater than a total dose tolerance of the second circuit die.

27. The radiation shielding integrated circuit device of claim 20, wherein:

thickness of the radiation shielding top is greater than thickness of the first x-ray shielding

tub; and

thickness of the radiation shielding bottom is greater than thickness of the second x-ray shielding tub.

28. An integrated circuit, comprising:

at least one circuit die;

means for shielding the at least one circuit die from isotropic ionizing radiation, wherein the means for shielding the at least one circuit die from isotropic ionizing radiation is configured

to shield the at least one circuit die from x-ray radiation from first selected angles, and

allows x-rays to reach the at least one circuit die from second selected angles; and

means for shielding the at least one circuit die from x-ray radiation from all angles.

29. An integrated circuit, comprising:

at least one circuit die;

an x-ray shielding tub comprising a bottom portion and sidewalls extending from the bottom portion, the bottom portion and the sidewalls comprising material for shielding from x-rays;

a first radiation shielding lid comprising material for shielding from ionizing radiation and x-rays; and

a second radiation shielding lid comprising material for shielding from ionizing radiation and x-rays;

wherein:

the at least one circuit die is disposed in the x-ray shielding tub;

the x-ray shielding tub is disposed between the first radiation shielding lid and the second radiation shielding lid;

the x-ray shielding tub, the first radiation shielding lid, and the second radiation shielding lid are configured to shield the at least one circuit die from x-rays from every direction; and

the x-ray shielding tub, the first radiation shielding lid, and the second radiation shielding lid do not completely enclose the at least one circuit die.

30. The integrated circuit of claim 29, wherein:

the first radiation shielding lid is not in direct contact with the x-ray shielding tub; and

the second radiation shielding lid is not in direct contact with the x-ray shielding tub.

31. The integrated circuit of claim 29, wherein:

the x-ray shielding tub provides less shielding of ionizing radiation than the first radiation shielding lid; and

the x-ray shielding tub provides less shielding of ionizing radiation than the second radiation shielding lid.

32. The integrated circuit of claim 29, wherein:

the x-ray shielding tub is thinner than the first radiation shielding lid; and

the x-ray shielding tub is thinner than the second radiation shielding lid.

33. An integrated circuit, comprising:

a base;

at least one circuit die;

an x-ray shielding tub comprising a bottom portion and sidewalls extending from the bottom portion, the bottom portion and the sidewalls comprising material for shielding from x-rays;

a first lid comprising material for shielding from ionizing radiation and x-rays;

a second lid comprising material for shielding from ionizing radiation and x-rays;

a first spacing ring comprising material for shielding from x-rays; and

a second spacing ring comprising material for shielding from x-rays;

wherein:

the at least one circuit die is disposed in the x-ray shielding tub;

the x-ray shielding tub is disposed on the base between the first lid and the second lid;

the first spacing ring is disposed between the base and the first lid, surrounding the x-ray shielding tub;

the second spacing ring is disposed between the base and the second lid;

the x-ray shielding tub, the first and second lids, and the first and second spacing rings are configured to shield the at least one circuit die from x-rays from every direction; and

the x-ray shielding tub, the first and second lids, and the first and second spacing rings do not completely enclose the at least one circuit die.

EVIDENCE APPENDIX

No evidence has been submitted in this case pursuant to 37 C.F.R. §§ 1.130, 1.131, or 1.132.

No evidence has been entered in the record by the Examiner and relied upon by Appellants in this Appeal.

RELATED PROCEEDINGS APPENDIX

Applicants-Appellants, Assignee, and the undersigned attorney do not know of any other appeal, interference, or judicial proceeding that is related to, directly affects, is directly affected by, or has a bearing on the decision of the Board of Patent Appeals and Interferences in this Appeal.